# BRAKE SHOE RETAINER CLIP

## BACKGROUND OF THE INVENTION

[1] This invention relates to a retainer clip for a brake shoe that helps to maintain proper shoe geometry. Specifically, retaining clips are mounted to each brake shoe to interact with the anchor pins for maintaining shoe contact, proper shoe orientation, and prevent shoe drag when the brake assembly is not applied.

[2] Drum brakes are widely used in vehicle braking systems. In a typical drum brake, two arcuate brake shoe assemblies are located inside a rotating cylindrical brake drum. Each brake shoe assembly includes a backing plate that carries brake lining friction material. A brake actuator moves the brake shoe assemblies toward the rotating brake drum such that the brake lining friction material contacts the inner surfaces of the drum, thus retarding the rotation of the drum.

[3] The brake shoe assemblies are mounted to a central plate or brake spider. At one end each brake shoe is pivotally supported on an anchor pin. At the opposite end of each brake shoe, the brake actuator (typically a cam) applies an actuation force against the shoes causing the shoes to pivot about axes define by the anchor pins. The actuator causes the brake shoes to pivot away from each other toward the rotating brake drum. Return springs are used to return the brake shoes after each brake actuation. The brake assembly also includes a pair of retainer springs for each brake shoe mounted on the anchor pin end. The retainer springs maintain the shoe contact and orientation with the anchor pin and prevent the shoe from dragging when the brake is not applied.

[4] In some instances, depending on the braking application, the retainer springs lack sufficient strength and fatigue life. In these circumstances, a heavier duty brake including a full web around the anchor pin is required, which increases cost.

[5] Further, the retaining springs are an extension spring type that is designed such that in the installed condition the spring is in a slight extension that results in a sufficient load to retain the weight of the shoe relative to the anchor pin. The spring includes a collection of closed coils with either hooks formed on the ends of the coils or hook details attached to the ends of the coils.

[6] There are several disadvantages to using an extension spring design. Coil clashing and stress concentrations can lead to early failure. Coil clashing is caused by the closed coil design where coils collide as a result of normal road vibration, which can result in fatigue failure. Another disadvantage is caused by the spring manufacturing process. This process typically includes coiling spring wire over a mandrel, which introduces a tool mark on the spring. The small diameter of the spring and the close coil design do not permit process enhancements, such as shot peening, resulting in a stress concentration in the already highly stressed inner coil area. Also, crimping hooks onto the ends of the spring introduces additional tool marks that result in stress concentrations.

[7] Thus, it is desirable to have a brake retaining mechanism that does not require extension springs. The brake retaining mechanism should be robust and be able to be used in multiple brake show configurations in addition to overcoming the above referenced deficiencies with prior art systems.

## SUMMARY OF THE INVENTION

[8] The subject invention includes a retaining clip that is used to maintain proper shoe contact and orientation for a cam actuated brake assembly. The retaining clip eliminates the need for retaining springs currently used in the brake assembly to maintain proper shoe geometry. The retaining clip is mounted to a brake shoe and cooperates with a brake shoe anchor pin to consistently achieve the correct orientation.

[9] In a disclosed embodiment, the brake assembly includes a pair of brake shoes having backing plates for supporting brake linings for actuation by a cam against a rotating drum. Each brake shoe has an anchor end and an actuation end. Each brake shoe is pivotally mounted at the anchor end to a brake spider with an anchor pin. When the brakes are applied, the cam acts against the actuation end causing the brake shoes to pivot away from one another about axes defined by the anchor pins.

[10] In the preferred embodiment, the retaining clip is mounted to the backing plate of the brake shoe. The retaining clip includes a base plate with a pair of transversely extending legs that support opposite ends of the anchor pin. The base plate preferably includes a resilient tab portion that grips a portion of the backing plate. The anchor pin includes a cylindrical body having a pair of pin ends of smaller diameter than the body extending outwardly from opposing sides of the body. The legs of the retaining clip preferably have hooked ends for engaging the pin ends. The hooked ends cooperate with the pin ends to maintain proper shoe geometry.

[11] The subject invention provides a brake shoe retaining clip that eliminates the need for retaining springs. The retaining clip provides a more robust design and has increased fatigue life over prior art systems. These and other features of the present

invention can be best understood from the following specification and drawings, the following of which is a brief description.

## BRIEF DESCRIPTION OF THE DRAWINGS

[12] Figure 1 is a schematic representation of a cam brake assembly incorporation the subject invention.

[13] Figure 2 is an exploded view of a prior art cam brake system.

[14] Figure 3 is an exploded view, partially cut-away, of one embodiment of the subject invention.

[15] Figure 4 is a side view of an alternate embodiment of the subject invention.

## DETAILED DESCRIPTION OF AN EXEMPLARY EMBODIMENT

[16] Referring to Figure 1, a brake shoe assembly having a retaining clip in accordance with the present invention is shown installed in a vehicular brake system.

[17] Figure 1 is a side view of a drum brake system 10. The drum brake system 10 includes a cylindrical brake drum 12, a first brake shoe assembly generally shown at 14, a second brake shoe assembly generally shown at 16, and an actuator 18. The general operation of the brake drum assembly 10 is known. The first and second brake shoe assemblies 14 and 16 are preferably identical such that a description of the first brake shoe assembly 14 or its components is also applicable to the second brake shoe assembly 16. The actuator 18, shown schematically in Figure 1, is an s-cam mechanism that is rotated during a brake actuation causing the brake shoes 14, 16 to engage the drum 12.

[18] The brake drum 12, which rotates about an axis of rotation 20, has an inner surface 22 and an outer surface 24. The first and second brake shoe assemblies 14 and 16, located adjacent to the inner surface 22 of the brake drum 12, include a brake lining

26 having a predetermined thickness. The brake linings 26 are comprised of a known friction material attached to a backing plate 28. Each brake lining 26 presents a wear surface 32, which contacts the inner surface 22 of the rotating brake drum 12 and wears further and further away each time the actuator 18 moves the first and second brake shoe assemblies 14 and 16 against the brake drum 12.

[19] Each brake shoe 14, 16 is pivotally mounted at one end 34 to a brake spider 36 with an anchor pin 38. The anchor pin ends 34 of the brake shoes 14, 16 are opposite from actuation ends 40 of the brake shoes 14, 16. The anchor pin 38 for the first brake shoe 14 defines a first pivot axis 42 and the anchor pin 38 for the second brake shoe 16 defines a second pivot axis 44. When the brakes are applied, the actuator 18 pivots the shoes 14, 16 about the first 42 and second 44 pivot axes, respectively.

[20] A prior art cam brake assembly is shown in Figure 2. This assembly includes a return spring 46 that returns the brake shoes 14, 16 to their original position after each brake actuation. The brake assembly also includes a pair of retainer springs 48 (only one set is shown) for each brake shoe 14, 16 mounted on the anchor pin end . The retainer springs 48 maintain the shoe contact and orientation with the anchor pin 38 and prevent the shoes 14, 16 from dragging when the brake is not applied.

[21] These retaining springs 48 are extension springs that are designed such that in the installed condition the spring is in a slight extension that results in a sufficient load to retain the weight of the shoe relative to the anchor pin 38. The use of this type of spring is disadvantageous and can lead to early failure. Coil clashing caused by normal road vibration can result in early fatigue failure. The spring manufacturing

process can introduce a tool marks on the spring resulting stress concentrations, which can lead to premature failure.

[22] Thus, the subject invention includes a retainer clip 50, shown in Figure 3, which eliminates the need for retaining springs 48. The retaining clip 50 preferably includes a base portion 52 with a pair of transversely extending legs 54 positioned on opposite sides of the base portion 52. Each leg 54 preferably has a hooked end 56 that engages the anchor pin 38. It should be understood that there is one retaining clip 50 for each brake shoe 14, 16. Thus, the retaining clip 50 shown in Figure 3 is the same for each brake shoe 14, 16.

[23] The anchor pin 38 includes a cylindrical body 58 and a pair of pin ends 60 positioned on opposite sides of the body 58 to define the pivot axis 42. The pin ends 60 have a significantly smaller diameter than the body 58. The hooked ends 56 of the clip 50 engage the pin ends 60 to maintain the proper shoe geometry.

[24] The clip 50 can be attached to any portion of the brake shoe 14 with any known attachment method, however, in the preferred embodiment the clip 50 is mounted to the backing plate 28 with a resilient tab 62. The tab 62 includes at least one grip 64 to engage the backing plate 28. Preferably the grip 64 is a pointed tooth member that clips onto the plate 28 such that the tab 62 is on one side of the plate 28 with the remaining portions of the base 52 being positioned on the opposite side of the plate 28.

[25] The clip 50 can be attached to the plate 28, as shown in Figure 3, or can be attached to another portion of the shoe 14, as shown in Figure 4. Each brake shoe 14 includes a pair of transversely extending webbed flanges 70 that extend inwardly toward the center of the brake assembly. The webbed flanges 70 define an engagement surface 72 that receives a portion of the body 58 of the anchor pin 28. In the alternate embodiment of Figure 4, the

clip 50 is shown attached to the flanges 70. The clip 50 can be attached to one or both of the flanges 70.

[26] When the cam 18 is applied, the shoes 14, 16, the clips 50, and the anchor pins 38 pivot as a unit about their respective axes 42, 44. The return spring 46 is used to return the shoes 14, 16 to their original position and the retaining clips 50 cooperate with the anchor pins 38 to maintain proper shoe contact and orientation.

[27] The subject invention provides a brake shoe retaining clip 50 that eliminates the need for retaining springs 48. The retaining clip 50 provides a more robust design and has increased fatigue life over prior art systems.

[28] Although a preferred embodiment of this invention has been disclosed, it should be understood that a worker of ordinary skill in the art would recognize many modifications come within the scope of this invention. For that reason, the following claims should be studied to determine the true scope and content of this invention.